

C/10/7081026

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FILE 'USPAT2' ENTERED AT 18:12:09 ON 26 JUN 2004

CA INDEXING COPYRIGHT (C) 2004 AMERICAN CHEMICAL SOCIETY (ACS)

=> s (polymer? or copolymer?) (10w) (heat transfer(1w) (medium or fluid or liquid))
L1 235 (POLYMER? OR COPOLYMER?) (10W) (HEAT TRANSFER(1W) (MEDIUM OR FLUID
OR LIQUID))

=> s (polymer? or copolymer?) (8w) (heat transfer(1w) (medium or fluid or liquid))
L2 207 (POLYMER? OR COPOLYMER?) (8W) (HEAT TRANSFER(1W) (MEDIUM OR FLUID
OR LIQUID))

=> s (polymer?) (8w) (heat transfer(1w) (medium or fluid or liquid))
L3 206 (POLYMER?) (8W) (HEAT TRANSFER(1W) (MEDIUM OR FLUID OR LIQUID))

=> s l3 and polystyrene
L4 32 L3 AND POLYSTYRENE

=> d l4 1-32 ibib abs

L4 ANSWER 1 OF 32 USPATFULL on STN

ACCESSION NUMBER: 2004:113918 USPATFULL

TITLE: Fuel cell and fuel cell coolant compositions

INVENTOR(S): Mohapatra, Satish C., Easton, PA, UNITED STATES

| | NUMBER | KIND | DATE |
|-----------------------|--|------|---------------|
| PATENT INFORMATION: | US 2004086757 | A1 | 20040506 |
| APPLICATION INFO.: | US 2002-282351 | A1 | 20021030 (10) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | APPLICATION | | |
| LEGAL REPRESENTATIVE: | Thomas G. Ryder, Esq., P.O. Box 716, Trexlertown, PA, 18087-0716 | | |
| NUMBER OF CLAIMS: | 16 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 4 Drawing Page(s) | | |
| LINE COUNT: | 878 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB This invention is directed to coolant compositions, particularly coolant compositions useful in fuel cells, and to fuel cells containing such coolant compositions. The coolant compositions or heat transfer fluids of this invention have and retain low electrical conductivity through extended periods of use. These coolants or heat transfer fluids are composed of a base composition and an additive package which imparts the property of retaining low electrical conductivity for extended periods of time. The base composition can be de-ionized water (DI water) alone or a mixture of DI water and a freezing point depressant of the types well-known in the art (e.g., propylene glycol). The additive package contains an organic corrosion inhibitor and a polymeric ion suppressant. The use of both components of the additive package is important.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 2 OF 32 USPATFULL on STN

ACCESSION NUMBER: 2003:160121 USPATFULL

TITLE: Phosphorus compound

INVENTOR(S): Onchi, Yoko, Himeji-shi, JAPAN
Takahashi, Ikuo, Kobe-shi, JAPAN

| | NUMBER | KIND | DATE |
|---------------------|---------------|------|---------------|
| PATENT INFORMATION: | US 2003109736 | A1 | 20030612 |
| APPLICATION INFO.: | US 2001-18971 | A1 | 20011226 (10) |

WO 2001-JP3423

20010420

| | NUMBER | DATE |
|-----------------------|---|----------|
| PRIORITY INFORMATION: | JP 2000-125777 | 20000426 |
| | JP 2000-125778 | 20000426 |
| | JP 2000-125779 | 20000426 |
| | JP 2000-247140 | 20000817 |
| | JP 2000-339664 | 20001107 |
| DOCUMENT TYPE: | Utility | |
| FILE SEGMENT: | APPLICATION | |
| LEGAL REPRESENTATIVE: | BIRCH STEWART KOLASCH & BIRCH, PO BOX 747, FALLS CHURCH, VA, 22040-0747 | |
| NUMBER OF CLAIMS: | 35 | |
| EXEMPLARY CLAIM: | 1 | |
| NUMBER OF DRAWINGS: | 6 Drawing Page(s) | |
| LINE COUNT: | 1962 | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The phosphorus-containing compound of the present invention is represented by the following formula (I), (II) or (III): ##STR1##

wherein Z^{sup.1}, Z^{sup.2} and Z^{sup.3} each represents a cycloalkane, a cycloalkene, a polycyclic aliphatic hydrocarbon or an aromatic hydrocarbon rings which may have a substituent; R represents a halogen atom, a hydroxyl, a carboxyl, a halocarboxyl (haloformyl), an alkyl, an alkoxy, an alkenyl or an aryl groups; A represents a polyvalent group corresponding to an alkane; Y^{sup.1}, Y^{sup.2} and Y^{sup.3} each represents --O--, --S-- or --NR^{sup.1}--, wherein R^{sup.1} represents a hydrogen atom or an alkyl group; k is an integer of to 6; m is an integer of 0 to 2; n is an integer of not less than 1; q is an integer of 0 to 5; r is 0 or 1; and S is an integer of 1 to 4.

The phosphorus-containing compound is excellent in heat resistance and is useful as flame retardants, plasticizers, or stabilizers.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 3 OF 32 USPATFULL on STN

ACCESSION NUMBER: 2003:13362 USPATFULL

TITLE: Method for producing impact-resistant modified thermoplastic moulding materials

INVENTOR(S): Schade, Christian, Ludwigshafen, GERMANY, FEDERAL REPUBLIC OF
Gausepohl, Hermann, Mutterstadt, GERMANY, FEDERAL REPUBLIC OF
Fischer, Wolfgang, Walldorf, GERMANY, FEDERAL REPUBLIC OF
Moors, Rainer, Germersheim, GERMANY, FEDERAL REPUBLIC OF
Warzelhan, Volker, Weisenheim, GERMANY, FEDERAL REPUBLIC OF

PATENT ASSIGNEE(S): BASF Aktiengesellschaft, Ludwigshafen, GERMANY, FEDERAL REPUBLIC OF (non-U.S. corporation)

| | NUMBER | KIND | DATE |
|---------------------|----------------|------|--------------|
| PATENT INFORMATION: | US 6506846 | B1 | 20030114 |
| | WO 9940135 | | 19990812 |
| APPLICATION INFO.: | US 2000-582882 | | 20000706 (9) |
| | WO 1999-EP480 | | 19990126 |

| | NUMBER | DATE |
|-----------------------|------------------|----------|
| PRIORITY INFORMATION: | DE 1998-19804912 | 19980207 |

DE 1998-19828104 19980624
DOCUMENT TYPE: Utility
FILE SEGMENT: GRANTED
PRIMARY EXAMINER: Seidleck, James J.
ASSISTANT EXAMINER: Asinovsky, Olga
LEGAL REPRESENTATIVE: Keil & Weinkauff
NUMBER OF CLAIMS: 9
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 0 Drawing Figure(s); 0 Drawing Page(s)
LINE COUNT: 621

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A process prepares impact-modified thermoplastic molding compositions which comprise a soft phase made from a rubber dispersed in a hard matrix composed of vinylaromatic monomers, where the hard matrix is prepared by anionic polymerization in the presence of a metal alkyl compound or a metal aryl compound of an element of the second or third main group, or of the second subgroup, of the Periodic Table.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 4 OF 32 USPATFULL on STN
ACCESSION NUMBER: 2002:295368 USPATFULL
TITLE: Process for the manufacture of temperature-sensitive polymers
INVENTOR(S): Brown, Jerry L., Heflin, AL, UNITED STATES
Notte, Patrick P.B., Wavre, BELGIUM

| | NUMBER | KIND | DATE |
|---------------------|----------------|------|---------------|
| PATENT INFORMATION: | US 2002165421 | A1 | 20021107 |
| APPLICATION INFO.: | US 2002-120009 | A1 | 20020410 (10) |

| | NUMBER | DATE |
|-----------------------|---|---------------|
| PRIORITY INFORMATION: | US 2001-283247P | 20010411 (60) |
| DOCUMENT TYPE: | Utility | |
| FILE SEGMENT: | APPLICATION | |
| LEGAL REPRESENTATIVE: | LATHROP & GAGE LC, 2345 GRAND AVENUE, SUITE 2800, KANSAS CITY, MO, 64108 | |
| NUMBER OF CLAIMS: | 31 | |
| EXEMPLARY CLAIM: | 1 | |
| LINE COUNT: | 450 | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Process for manufacturing temperature-sensitive **polymers** utilizing a **heat transfer fluid** comprising a hydrocarbon fluid selected from aliphatic hydrocarbons, alicyclic hydrocarbons, aliphatic- or alicyclic-substituted aromatic hydrocarbons, or mixtures thereof, the hydrocarbon fluid having a boiling point from 220° C. to 250° C. and a melting point less than 40° C., and temperature-sensitive polymer articles produced therefrom.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 5 OF 32 USPATFULL on STN
ACCESSION NUMBER: 2002:152729 USPATFULL
TITLE: Highly rigid, high-tenacity impact-resistant **polystyrene**
INVENTOR(S): Desbois, Philippe, Maikammer, GERMANY, FEDERAL REPUBLIC OF
Schade, Christian, Ludwigshafen, GERMANY, FEDERAL REPUBLIC OF
Gausepohl, Hermann, Mutterstadt, GERMANY, FEDERAL REPUBLIC OF

Warzelhan, Volker, Weisenheim, GERMANY, FEDERAL
REPUBLIC OF
PATENT ASSIGNEE(S): BASF Aktiengesellschaft, Ludwigshafen, GERMANY, FEDERAL
REPUBLIC OF (non-U.S. corporation)

| | NUMBER | KIND | DATE |
|---------------------|----------------|------|-----------------------|
| PATENT INFORMATION: | US 6410654 | B1 | 20020625 |
| | WO 9967308 | | 19991229 |
| APPLICATION INFO.: | US 2000-719818 | | 20001218 (9) |
| | WO 1999-EP4343 | | 19990623 |
| | | | 20001218 PCT 371 date |

| | NUMBER | DATE |
|-----------------------|--|----------|
| PRIORITY INFORMATION: | DE 1998-19828104 | 19980624 |
| DOCUMENT TYPE: | Utility | |
| FILE SEGMENT: | GRANTED | |
| PRIMARY EXAMINER: | Seidleck, James J. | |
| ASSISTANT EXAMINER: | Asinovsky, Olga | |
| LEGAL REPRESENTATIVE: | Keil & Weinkauff | |
| NUMBER OF CLAIMS: | 13 | |
| EXEMPLARY CLAIM: | 1 | |
| NUMBER OF DRAWINGS: | 0 Drawing Figure(s); 0 Drawing Page(s) | |
| LINE COUNT: | 1009 | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB An anionically polymerized impact-modified **polystyrene** has a yield stress of at least 24 MPa, measured at 23° C. to DIN 53455 and a hole impact strength of at least 11 kJ/m.sup.2, measured at 23° C. to DIN 53753, measured in each case on a specimen produced to ISO 3167. A preparation process is described.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 6 OF 32 USPATFULL on STN
ACCESSION NUMBER: 2002:45704 USPATFULL
TITLE: Method for removing volatile matter from polymer solution composition
INVENTOR(S): Fujitaka, Toshihisa, Kitakyushu, JAPAN
Hirashima, Koji, Kitakyushu, JAPAN
Ono, Hideki, Kitakyushu, JAPAN
Hayashi, Keiichi, Kisarazu, JAPAN
PATENT ASSIGNEE(S): Nippon Steel Chemical Co., Ltd., Tokyo, JAPAN (non-U.S. corporation)

| | NUMBER | KIND | DATE |
|---------------------|----------------|------|-----------------------|
| PATENT INFORMATION: | US 6353088 | B1 | 20020305 |
| | WO 9950314 | | 19991007 |
| APPLICATION INFO.: | US 2000-646574 | | 20000919 (9) |
| | WO 1999-JP1576 | | 19990326 |
| | | | 20000919 PCT 371 date |

| | NUMBER | DATE |
|-----------------------|--|----------|
| PRIORITY INFORMATION: | JP 1998-81934 | 19980327 |
| DOCUMENT TYPE: | Utility | |
| FILE SEGMENT: | GRANTED | |
| PRIMARY EXAMINER: | Acquah, Samuel A. | |
| LEGAL REPRESENTATIVE: | Birch, Stewart, Kolasch & Birch, LLP | |
| NUMBER OF CLAIMS: | 3 | |
| EXEMPLARY CLAIM: | 1 | |
| NUMBER OF DRAWINGS: | 2 Drawing Figure(s); 1 Drawing Page(s) | |
| LINE COUNT: | 580 | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB This invention relates to a method for removing unreacted monomers and other volatile matters from a polymer solution composition produced from a mixture containing an aromatic vinyl monomer, utilizes two or more flash devolatilizing vessels, and effects the removal by adjusting the solid content of the polymer solution composition at the outlet of the devolatilizer before the last-stage devolatilizer to a level in excess of 97%, adding 0.5-4 parts by weight of a foaming agent to the total polymer solution composition, passing the polymer solution composition through the last-stage devolatilizer while maintaining the pressure of the polymer solution at 10 kg/cm^{sup.2} or more by means of a pressure controller and the temperature in the range 190-260° C., introducing the polymer solution composition to a vapor-liquid separation vessel maintained at a vacuum of 20 Torr or less, and allowing the composition to foam.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 7 OF 32 USPATFULL on STN

ACCESSION NUMBER: 2000:157547 USPATFULL
TITLE: Polymer recovery
INVENTOR(S): Abel, Jr., Richard C., Lake Jackson, TX, United States
Rowland, Michael E., Lake Jackson, TX, United States
Combs, Robert B., Lake Jackson, TX, United States
Soape, Jerry W., Beaumont, TX, United States
Smith, Stanley W., Lake Jackson, TX, United States
PATENT ASSIGNEE(S): The Dow Chemical Company, Midland, MI, United States
(U.S. corporation)
E. I. du Pont de Nemours and Company, Wilmington, DE,
United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---------------------|----------------|------|--------------|
| PATENT INFORMATION: | US 6150498 | | 20001121 |
| APPLICATION INFO.: | US 1997-887860 | | 19970703 (8) |

| | NUMBER | DATE |
|-----------------------|--|---------------|
| PRIORITY INFORMATION: | US 1996-21678P | 19960712 (60) |
| DOCUMENT TYPE: | Utility | |
| FILE SEGMENT: | Granted | |
| PRIMARY EXAMINER: | Boykin, Terressa M. | |
| NUMBER OF CLAIMS: | 27 | |
| EXEMPLARY CLAIM: | 1 | |
| NUMBER OF DRAWINGS: | 7 Drawing Figure(s); 8 Drawing Page(s) | |
| LINE COUNT: | 1206 | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Methods for devolatilizing polymer solutions have been invented which include, in certain aspects, dissolving a viscous polymer in a solvent forming a polymer-solvent solution, introducing the polymer-solvent solution into a thermal dryer, heating or cooling the polymer-solvent solution in the thermal dryer forming product polymer with solvent removed and separated solvent (which may include other residuals), the separated solvent with other residuals if present vaporizing in the thermal dryer forming a vapor, removing the vapor from the thermal dryer, and discharging product polymer from the thermal dryer.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 8 OF 32 USPATFULL on STN

ACCESSION NUMBER: 2000:109947 USPATFULL
TITLE: Methods for solid state polymerizing polyesters
utilizing carbon dioxide
INVENTOR(S): DeSimone, Joseph M., Chapel Hill, NC, United States

PATENT ASSIGNEE(S): Maier, Gerhard, Munich, Germany, Federal Republic of
The University of North Carolina at Chapel Hill, Chapel
Hill, NC, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|--|------|--------------|
| PATENT INFORMATION: | US 6107443 | | 20000822 |
| APPLICATION INFO.: | US 1998-176161 | | 19981021 (9) |
| RELATED APPLN. INFO.: | Continuation of Ser. No. US 1997-903269, filed on 25 Jul 1997 which is a continuation of Ser. No. US 1995-471500, filed on 6 Jun 1995, now abandoned | | |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Boykin, Terressa M. | | |
| LEGAL REPRESENTATIVE: | Myers Bigel Sibley & Sajovec | | |
| NUMBER OF CLAIMS: | 6 | | |
| EXEMPLARY CLAIM: | 1 | | |
| LINE COUNT: | 903 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The present invention provides processes for preparing polyesters. The processes include (a) providing a polymerization medium comprising carbon dioxide, (b) contacting a monomer capable of forming a polyester polymer with the polymerization medium, and (c) polymerizing the monomer in the polymerization medium. The processes of the present invention include preparing polyesters by direct esterification polymerization, transesterification polymerization, melt acidolysis polymerization and acid halide polymerization. As a further aspect, the present invention provides a method of separating the polyester produced from the polymerization medium. Polyester polymers prepared according to the methods of the present invention are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 9 OF 32 USPATFULL on STN

ACCESSION NUMBER: 1999:137440 USPATFULL
TITLE: Process for the preparation of polyesters in carbon
dioxide
INVENTOR(S): DeSimone, Joseph M., Chapel Hill, NC, United States
Maier, Gerhard, Munich, Germany, Federal Republic of
PATENT ASSIGNEE(S): The University of North Carolina at Chapel Hill, Chapel
Hill, NC, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|--|------|--------------|
| PATENT INFORMATION: | US 5977292 | | 19991102 |
| APPLICATION INFO.: | US 1997-903269 | | 19970725 (8) |
| RELATED APPLN. INFO.: | Continuation of Ser. No. US 1995-471500, filed on 6 Jun 1995, now abandoned | | |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Henderson, Christopher | | |
| LEGAL REPRESENTATIVE: | Myers Bigel Sibley & Sajovec | | |
| NUMBER OF CLAIMS: | 28 | | |
| EXEMPLARY CLAIM: | 1 | | |
| LINE COUNT: | 961 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The present invention provides processes for preparing polyesters. The processes include (a) providing a polymerization medium comprising carbon dioxide, (b) contacting a monomer capable of forming a polyester polymer with the polymerization medium, and (c) polymerizing the monomer in the polymerization medium. The processes of the present invention include preparing polyesters by direct esterification polymerization, transesterification polymerization, melt acidolysis polymerization and acid halide polymerization. As a further aspect, the present invention

provides a method of separating the polyester produced from the polymerization medium. Polyester polymers prepared according to the methods of the present invention are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 10 OF 32 USPATFULL on STN

ACCESSION NUMBER: 1999:137400 USPATFULL

TITLE: Non-adiabatic olefin solution polymerization

INVENTOR(S): Kao, Che I., Lake Jackson, TX, United States

Combs, R. Bruce, Lake Jackson, TX, United States

Camp, Gary A., Lake Jackson, TX, United States

Eversdyk, David A., Angleton, TX, United States

Jain, Pradeep, Lake Jackson, TX, United States

Winter, Greg A., Lake Jackson, TX, United States

Stultz, Jeff H., Freeport, TX, United States

PATENT ASSIGNEE(S): The Dow Chemical Company, Midland, MI, United States
(U.S. corporation)

NUMBER KIND DATE

PATENT INFORMATION: US 5977251 19991102

APPLICATION INFO.: US 1997-831172 19970401 (8)

NUMBER DATE

PRIORITY INFORMATION: US 1996-14705P 19960401 (60)

DOCUMENT TYPE: Utility

FILE SEGMENT: Granted

PRIMARY EXAMINER: Wu, David W.

NUMBER OF CLAIMS: 62

EXEMPLARY CLAIM: 1

NUMBER OF DRAWINGS: 9 Drawing Figure(s); 8 Drawing Page(s)

LINE COUNT: 2674

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A solution polymerization system for polymerizing a olefin monomer by reacting the monomer with catalyst and solvent has been invented. The system in one aspect including a flow loop with a product polymer outlet, the flow loop forming a recycling reactor, a catalyst inlet on the flow loop through which catalyst and solvent flow into the flow loop, a monomer inlet on the flow loop through which monomer and solvent flow into the flow loop and, with the catalyst, form a reactant materials stream, a first heat exchanger on the flow loop for receiving the reactant materials stream and any formed polymer and for removing heat of reaction or polymerization from the flow loop, and pump apparatus for pumping the reactant materials stream and formed polymer in the flow loop and from the first heat exchanger to the product polymer outlet. In one aspect, the system includes at least one additional heat exchanger on the flow loop for receiving the reactant materials stream and formed polymer and for removing heat of reaction or polymerization from the flow loop, the pump apparatus pumping formed polymer and remaining reactant materials to the product polymer outlet, and a portion of the formed polymer and remaining reactant materials flowing out from the product polymer outlet and the remainder recycling through the flow loop. In one aspect systems and methods according to the present invention are used to make polyethylene.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 11 OF 32 USPATFULL on STN

ACCESSION NUMBER: 1999:113796 USPATFULL

TITLE: Manufacturing ultramicrocellular polymer foams at low pressure

INVENTOR(S): Handa, Y. Paul, 797 Lalande Terr., Orleans, Ontario,

Canada K4A 2M4
Zhang, Zhiyi, 9-395 Carmen Street, Vanier, Ontario,
Canada K1L 6Y1

| | NUMBER | KIND | DATE |
|-----------------------|--|------|--------------|
| PATENT INFORMATION: | US 5955511 | | 19990921 |
| APPLICATION INFO.: | US 1998-144115 | | 19980831 (9) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Foelak, Morton | | |
| LEGAL REPRESENTATIVE: | Anderson, J. Wayne | | |
| NUMBER OF CLAIMS: | 20 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 11 Drawing Figure(s); 11 Drawing Page(s) | | |
| LINE COUNT: | 541 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The invention disclosed provides a method for producing ultramicrocellular polymer foams at low pressures. A polymer is saturated with a blowing agent at low temperatures and pressures within a short time period, due to retrograde vitrification. The blowing agent may be in the form of a gas or a volatile liquid. Polymer-blowing agent combinations are selected to provide a processing temperature/pressure in the area below the positive slope portion of the retrograde vitrification profile of the glass transition temperature of the polymer versus pressure. The polymer thus saturated has an exceptionally high blowing agent content, and is then foamed to produce materials with small cells and high cell density.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 12 OF 32 USPATFULL on STN

ACCESSION NUMBER: 1999:102866 USPATFULL
TITLE: Process for the preparation of polyester in carbon dioxide
INVENTOR(S): DeSimone, Joseph M., Chapel Hill, NC, United States
Maier, Gerhard, Munich, Germany, Federal Republic of
PATENT ASSIGNEE(S): The University of North Carolina at Chapel Hill, Chapel Hill, NC, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|---|------|--------------|
| PATENT INFORMATION: | US 5945477 | | 19990831 |
| APPLICATION INFO.: | US 1996-721571 | | 19960926 (8) |
| RELATED APPLN. INFO.: | Division of Ser. No. US 1995-471500, filed on 6 Jun 1995, now abandoned | | |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Henderson, Christopher | | |
| LEGAL REPRESENTATIVE: | Myers Bigel Sibley & Sajovec | | |
| NUMBER OF CLAIMS: | 7 | | |
| EXEMPLARY CLAIM: | 1 | | |
| LINE COUNT: | 901 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The present invention provides processes for preparing polyesters. The processes include (a) providing a polymerization medium comprising carbon dioxide, (b) contacting a monomer capable of forming a polyester polymer with the polymerization medium, and (c) polymerizing the monomer in the polymerization medium. The processes of the present invention include preparing polyesters by direct esterification polymerization, transesterification polymerization, melt acidolysis polymerization and acid halide polymerization. As a further aspect, the present invention provides a method of separating the polyester produced from the polymerization medium. Polyester polymers prepared according to the

methods of the present invention are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 13 OF 32 USPATFULL on STN

ACCESSION NUMBER: 1998:36826 USPATFULL

TITLE: Process for the preparation of polyesters and copolyesters, the products prepared by this process and their use

INVENTOR(S): Simon, Peter, Eppstein, Germany, Federal Republic of Henze, Andree, Hofheim, Germany, Federal Republic of Blatter, Karsten, Eppstein, Germany, Federal Republic of

PATENT ASSIGNEE(S): Hoechst Aktiengesellschaft, Germany, Federal Republic of (non-U.S. corporation)

| | NUMBER | KIND | DATE |
|---------------------|----------------|------|--------------|
| PATENT INFORMATION: | US 5736621 | | 19980407 |
| APPLICATION INFO.: | US 1996-670549 | | 19960627 (8) |

| | NUMBER | DATE |
|-----------------------|---------------------|----------|
| PRIORITY INFORMATION: | DE 1995-19523261 | 19950627 |
| DOCUMENT TYPE: | Utility | |
| FILE SEGMENT: | Granted | |
| PRIMARY EXAMINER: | Mosley, Terressa M. | |
| LEGAL REPRESENTATIVE: | Connolly & Hutz | |
| NUMBER OF CLAIMS: | 44 | |
| EXEMPLARY CLAIM: | 1 | |
| LINE COUNT: | 1177 | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A process is described for the preparation of polyesters by polycondensation of dicarboxylic acid-diol precondensates (oligomers) at elevated temperature in a liquid heat transfer medium in the presence of customary polycondensation catalysts and, if appropriate, cocondensable modifying agents, wherein the liquid heat transfer medium is inert and free of aromatic structural groups and has a boiling point in the range from 200° to 320° C., wherein the weight ratio of dicarboxylic acid-diol precondensate (oligomers) employed to liquid heat transfer medium is in the range from 20:80 to 80:20 and wherein the polycondensation is carried out in the reaction mixture at 200° to 320° C. in the presence of a dispersion stabilizer. Furthermore, the polyesters and copolyester which can be prepared by the process and their use are described.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 14 OF 32 USPATFULL on STN

ACCESSION NUMBER: 96:38948 USPATFULL

TITLE: Polymer foams with inherent nonflammability and thermal stability and methods of preparation thereof

INVENTOR(S): Nichols, Gus, 2501 Gulf-Freeway, #5, Dickinson, TX, United States 77539
Armeniades, C. D., 2127 Addison Rd., Houston, TX, United States 77030

| | NUMBER | KIND | DATE |
|---------------------|-----------------|------|--------------|
| PATENT INFORMATION: | US 5514726 | | 19960507 |
| APPLICATION INFO.: | US 1992-945277 | | 19920915 (7) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Johnson, Rachel | | |

LEGAL REPRESENTATIVE: Pravel, Hewitt, Kimball & Krieger
NUMBER OF CLAIMS: 8
EXEMPLARY CLAIM: 1
LINE COUNT: 1164

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Polymeric foams with novel chemical compositions are prepared by the condensation of specially-synthesized precursors, which contain (in addition to carbon and hydrogen) one or more of the following elements: oxygen, fluorine, nitrogen (in structures with stable chemical bonds), silicon, boron, phosphorus (in high oxidation states), and certain metals (and/or their oxides and hydroxides). Upon mixing in the proper proportions and/or heating these precursors react rapidly to generate polymeric networks, consisting of heterocyclic crosslink centers, connected with heterochain segments; hydrogen is largely eliminated or replaced by fluorine. These structures possess inherent nonflammability and high thermoxidative stability. Foaming is effected by the gaseous by-products of the condensation reactions, as well as by the addition of foaming agents. The resulting foam products can be formulated to have a wide range of densities and flexibilities.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 15 OF 32 USPATFULL on STN

ACCESSION NUMBER: 96:7548 USPATFULL

TITLE: Azlactone-functional polymer blends, articles produced therefrom and methods for preparing both

INVENTOR(S): Coleman, Patrick L., Minneapolis, MN, United States
Heilmann, Steven M., Afton, MN, United States
Kangas, Steven L., Woodbury, MN, United States
Rasmussen, Jerald K., May Township, Washington County, MN, United States
Rolando, Richard J., Oakdale, MN, United States
Stahl, Julie B., St. Paul, MN, United States
PATENT ASSIGNEE(S): Minnesota Mining and Manufacturing Company, St. Paul, MN, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|---|------|--------------|
| PATENT INFORMATION: | US 5486358 | | 19960123 |
| APPLICATION INFO.: | US 1995-415730 | | 19950403 (8) |
| RELATED APPLN. INFO.: | Division of Ser. No. US 1993-119036, filed on 9 Sep 1993, now patented, Pat. No. US 5408002 | | |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Buttner, David | | |
| LEGAL REPRESENTATIVE: | Griswold, Gary L., Kirn, Walter N., Hornickel, John H. | | |
| NUMBER OF CLAIMS: | 5 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 3 Drawing Figure(s); 1 Drawing Page(s) | | |
| LINE COUNT: | 2166 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB An azlactone-functional thermoplastic composition is disclosed, The composition is a blend of an azlactone-functional composition and a thermoplastic polymer. A method of making azlactone-functional homopolymers by bulk homopolymerization is disclosed, optionally also concurrent or sequential blending of a thermoplastic polymer. A method of blending azlactone-functional compositions and thermoplastic polymers is disclosed. Molded articles coupled with biologically active substances are claimed.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 16 OF 32 USPATFULL on STN

ACCESSION NUMBER: 95:34248 USPATFULL

TITLE: Azlactone-functional polymer blends, articles produced therefrom and methods for preparing both

INVENTOR(S): Coleman, Patrick L., Minneapolis, MN, United States
 Heilmann, Steven M., Afton, MN, United States
 Kangas, Steven L., Woodbury, MN, United States
 Menzies, Robert H., Hudson, WI, United States
 Rasmussen, Jerald K., May Township, Washington County, MN, United States
 Rolando, Richard J., Oakdale, MN, United States
 Sahlin, Jennifer J., Oakdale, MN, United States
 Stahl, Julie B., St. Paul, MN, United States

PATENT ASSIGNEE(S): Minnesota Mining and Manufacturing Company, St. Paul, MN, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|--|------|--------------|
| PATENT INFORMATION: | US 5408002 | | 19950418 |
| APPLICATION INFO.: | US 1993-119036 | | 19930909 (8) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Buttner, David | | |
| LEGAL REPRESENTATIVE: | Griswold, Gary L., Kirn, Walter N., Hornickel, John H. | | |
| NUMBER OF CLAIMS: | 28 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 3 Drawing Figure(s); 1 Drawing Page(s) | | |
| LINE COUNT: | 2289 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB An azlactone-functional thermoplastic composition is disclosed. The composition is a blend of an azlactone-functional composition and a thermoplastic polymer. A method of making azlactone-functional homopolymers by bulk homopolymerization is disclosed, optionally also concurrent or sequential blending of a thermoplastic polymer. A method of blending azlactone-functional compositions and thermoplastic polymers is disclosed. Molded articles and adduct molded articles formed from the thermoplastic composition are disclosed.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 17 OF 32 USPATFULL on STN

ACCESSION NUMBER: 91:45926 USPATFULL

TITLE: Flexible hose heat exchanger construction with combination locating and thawing wire

INVENTOR(S): Chiles, Daniel T., 1972 S. Oak Grove, Springfield, MO, United States 65802
 Chiles, Richard M., 5000 Shady Oaks Dr., Springfield, MO, United States 65804

| | NUMBER | KIND | DATE |
|-----------------------|---|------|--------------|
| PATENT INFORMATION: | US 5022459 | | 19910611 |
| APPLICATION INFO.: | US 1988-280543 | | 19881206 (7) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Ford, John | | |
| LEGAL REPRESENTATIVE: | Kokjer, Kircher, Bradley, Wharton, Bowman & Johnson | | |
| NUMBER OF CLAIMS: | 1 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 11 Drawing Figure(s); 3 Drawing Page(s) | | |
| LINE COUNT: | 488 | | |

AB A flexible hosing for circulation of a heat transfer fluid to effect heat exchange within a concrete or other type of slab. An inner wall comprising nylon, rayon or other similar material forms an inner wall of the hosing to resist corrosive attack by the heat transfer fluid. A locator wire is embedded within the hosing for transmission of a

locating signal so that the position of the hosing within the slab may be accurately determined. The wire may also serve as an electrical resistance heating element should the heat transfer fluid become frozen, or should it be desired that the heat exchange system be operated without an external boiler or other heat source.

L4 ANSWER 18 OF 32 USPATFULL on STN

ACCESSION NUMBER: 90:54369 USPATFULL
TITLE: Centrifugal devolatilizer
INVENTOR(S): Hay, II, Robert A., Midland, MI, United States
Dowell, Albert C., Mt. Pleasant, MI, United States
PATENT ASSIGNEE(S): The Dow Chemical Company, Midland, MI, United States
(U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|---|------|--------------|
| PATENT INFORMATION: | US 4940472 | | 19900710 |
| APPLICATION INFO.: | US 1989-297371 | | 19890117 (7) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Nozick, Bernard | | |
| LEGAL REPRESENTATIVE: | Dean, Jr., J. Robert | | |
| NUMBER OF CLAIMS: | 3 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 12 Drawing Figure(s); 3 Drawing Page(s) | | |
| LINE COUNT: | 586 | | |

AB A devolatilization apparatus is provided which removes volatiles from a variety of polymer products utilizing centrifugal forces to control the residence time of the polymer in the devolatilizer. Volatiles are efficiently removed without degrading the polymer product. The devolatilizer includes a rotatable annular chamber having an inlet, a first outlet located at a first distance from the axis of rotation of the chamber, and a second outlet located at a second distance from the axis of rotation of the chamber. Means are also provided for supplying a polymer, in liquid form, to the inlet to the annular chamber. The portion of the chamber located between the first and second outlets forms an annular pocket or subchamber. The apparatus also includes means to rotate the annular chamber at a speed sufficient to cause the liquid polymer to flow through the first and second outlets and form liquid seals at each of the outlets. A vacuum source communicating with the annular pocket is provided for removing the volatile constituents from the liquid polymer.

L4 ANSWER 19 OF 32 USPATFULL on STN

ACCESSION NUMBER: 89:53568 USPATFULL
TITLE: Jacketed polymer optical waveguides
INVENTOR(S): Pierini, Peter E., Berkeley, CA, United States
McCormack, Thomas M., Baton Rouge, LA, United States
Pedersen, David R., Clayton, CA, United States
PATENT ASSIGNEE(S): The Dow Chemical Company, Midland, MI, United States
(U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|-------------------|------|--------------|
| PATENT INFORMATION: | US 4844578 | | 19890704 |
| APPLICATION INFO.: | US 1988-196587 | | 19880503 (7) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Sikes, William L. | | |
| ASSISTANT EXAMINER: | Wise, Robert E. | | |
| LEGAL REPRESENTATIVE: | Sims, Norman L. | | |
| NUMBER OF CLAIMS: | 7 | | |

EXEMPLARY CLAIM: 1
LINE COUNT: 581

AB The invention is a jacketed polymer optical fiber which comprises: an optical fiber which comprises a core formed from a light transmitting polymeric material having a first refractive index and a cladding formed from a polymeric material having a second refractive index which is lower than the first refractive index; and a jacket about the optical fiber wherein the jacket comprises a chlorinated polyethylene. The jacketed fibers of this invention have a higher service temperature than polyethylene jacketed fibers. The jacketed polymer optical waveguides of this invention are jacketed under conditions such that the optical properties of the polymer optical waveguide are not substantially degraded. The jacketed polymer optical waveguides have relatively low brittleness at use temperatures, good rigidity, and good solvent resistance. They also contain no material which tend to migrate into the polymer optical waveguide.

L4 ANSWER 20 OF 32 USPATFULL on STN

ACCESSION NUMBER: 88:68383 USPATFULL
TITLE: Flexible hose heat exchanger construction
INVENTOR(S): Chiles, Daniel T., Rte. 1, Box 479A, Ashgrove, MO, United States 65604
Chiles, Richard M., 2127 S. Florence, Springfield, MO, United States 65807

| | NUMBER | KIND | DATE |
|-----------------------|---|------|--------------|
| PATENT INFORMATION: | US 4779673 | | 19881025 |
| APPLICATION INFO.: | US 1986-907791 | | 19860916 (6) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Lazarus, Ira S. | | |
| ASSISTANT EXAMINER: | Neils, Peggy | | |
| LEGAL REPRESENTATIVE: | Kokjer, Kircher, Bradley, Wharton, Bowman & Johnson | | |
| NUMBER OF CLAIMS: | 18 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 9 Drawing Figure(s); 2 Drawing Page(s) | | |
| LINE COUNT: | 438 | | |

AB A heat exchanger construction for melting snow, heating buildings or objects and transferring solar heat. The construction embodies a flexible, multilayered, reinforced composite hose embedded in or affixed to a slab or other body. The composite construction combines the advantages of metal, extruded rubber and plastic piping to produce substantial durability, pressure rating, resistance to oxygen permeation, temperature tolerance, and corrosion resistance, while remaining extremely flexible and thus easy to install. Three embodiments are described and illustrated.

L4 ANSWER 21 OF 32 USPATFULL on STN

ACCESSION NUMBER: 87:71716 USPATFULL
TITLE: Heat curable solventless liquid prepolymer and novel monomer derived from hexylcarbitol for use therewith
INVENTOR(S): Markle, Richard A., Columbus, OH, United States
Melchior, Wayne R., Plymouth, MI, United States
PATENT ASSIGNEE(S): Eagle Picher Industries, Inc., Cincinnati, OH, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|--------------------------------------|------|-----------------|
| PATENT INFORMATION: | US 4699965 | | 19871013 |
| APPLICATION INFO.: | US 1985-750403 | | 19850628 (6) |
| RELATED APPLN. INFO.: | Division of Ser. No. US 1983-459947, | | filed on 21 Jan |

1983, now patented, Pat. No. US 4562008
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Michl, Paul R.
LEGAL REPRESENTATIVE: Wood, Herron & Evans
NUMBER OF CLAIMS: 10
EXEMPLARY CLAIM: 1
LINE COUNT: 439

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A solventless prepolymer which is liquid at room temperature and cures at about 350° F. The novel prepolymer is formed from a rubber monomer; acrylonitrile or methacrylonitrile; and an ether derivative of methylol acrylamide. The ether is formed from methylol acrylamide and an alcohol which boils above the cure temperature of the prepolymer and which preferably is hexyl carbitol. The prepolymer is formed with sufficient chain transfer agent to establish a weight average molecular weight of the prepolymer less than about 25,000. The prepolymer is heat curable to form a solid polymer with excellent compression set, tensile strength, and fuel resistivity. The method of formulating these polymers is also disclosed.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 22 OF 32 USPATFULL on STN

ACCESSION NUMBER: 86:71629 USPATFULL
TITLE: N-[[2-(1,3-dihydro-1,3-dioxo-2H-isoindol-Z-yl)ethoxy)methyl]-Z-propenamide
INVENTOR(S): Markle, Richard A., Columbus, OH, United States
PATENT ASSIGNEE(S): Eagle-Picher Industries, Inc., Cincinnati, OH, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|--|------|--------------|
| PATENT INFORMATION: | US 4629796 | | 19861216 |
| APPLICATION INFO.: | US 1985-738740 | | 19850529 (6) |
| RELATED APPLN. INFO.: | Division of Ser. No. US 1983-459778, filed on 21 Jan 1983, now patented, Pat. No. US 4536582 | | |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Daus, Donald G. | | |
| ASSISTANT EXAMINER: | Teoli, Jr., William A. | | |
| LEGAL REPRESENTATIVE: | Wood, Herron & Evans | | |
| NUMBER OF CLAIMS: | 1 | | |
| EXEMPLARY CLAIM: | 1 | | |
| LINE COUNT: | 349 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A heat curable, solventless liquid prepolymer is prepared from a rubber monomer; a nitrile monomer such as acrylonitrile or methacrylonitrile; and a novel monomer having the following formula: ##STR1## The prepolymer is formed with sufficient chain transfer agent to establish a weight average molecular weight less than about 25,000. This low viscosity prepolymer is heat curable to form a solid rubber polymer suitable for use as a gasket.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 23 OF 32 USPATFULL on STN

ACCESSION NUMBER: 85:76682 USPATFULL
TITLE: Heat curable solventless liquid prepolymer and novel monomer derived from hexylcarbitol for use therewith
INVENTOR(S): Markle, Richard A., Columbus, OH, United States
Melchior, Wayne R., Plymouth, MI, United States
PATENT ASSIGNEE(S): Eagle-Picher Industries, Inc., Cincinnati, OH, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|----------------------|------|--------------|
| PATENT INFORMATION: | US 4562008 | | 19851231 |
| APPLICATION INFO.: | US 1983-459947 | | 19830121 (6) |
| DISCLAIMER DATE: | 20020716 | | |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Wong, Jr., Harry | | |
| LEGAL REPRESENTATIVE: | Wood, Herron & Evans | | |
| NUMBER OF CLAIMS: | 6 | | |
| EXEMPLARY CLAIM: | 1 | | |
| LINE COUNT: | 390 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A solventless prepolymer which is liquid at room temperature and cures at about 350° F. The novel prepolymer is formed from a rubber monomer; acrylonitrile or methacrylonitrile; and an ether derivative of methylol acrylamide. The ether is formed from methylol acrylamide and an alcohol which boils above the cure temperature of the prepolymer and which preferably is hexyl carbitol. The prepolymer is formed with sufficient chain transfer agent to establish a weight average molecular weight of the prepolymer less than about 25,000. The prepolymer is heat curable to form a solid polymer with excellent compression set, tensile strength, and fuel resistivity. The method of formulating these polymers is also disclosed.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 24 OF 32 USPATFULL on STN
 ACCESSION NUMBER: 85:49340 USPATFULL
 TITLE: Heat curable solventless liquid prepolymer and novel monomer prepared from N-(2-hydroxyalkyl)phthalimide
 INVENTOR(S): Markle, Richard A., Columbus, OH, United States
 PATENT ASSIGNEE(S): Eagle-Picher Industries, Inc., Cincinnati, OH, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|------------------------|------|--------------|
| PATENT INFORMATION: | US 4536582 | | 19850820 |
| APPLICATION INFO.: | US 1983-459778 | | 19830121 (6) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Daus, Donald G. | | |
| ASSISTANT EXAMINER: | Teoli, Jr., William A. | | |
| LEGAL REPRESENTATIVE: | Wood, Herron & Evans | | |
| NUMBER OF CLAIMS: | 5 | | |
| EXEMPLARY CLAIM: | 1 | | |
| LINE COUNT: | 372 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A heat curable, solventless liquid prepolymer is prepared from a rubber monomer; a nitrile monomer such as acrylonitrile or methacrylonitrile; and a novel monomer having the following formula: ##STR1## The prepolymer is formed with sufficient chain transfer agent to establish a weight average molecular weight less than about 25,000. This low viscosity prepolymer is heat curable to form a solid rubber polymer suitable for use as a gasket.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 25 OF 32 USPATFULL on STN
 ACCESSION NUMBER: 85:41753 USPATFULL
 TITLE: Heat curable solventless liquid prepolymer
 INVENTOR(S): Melchior, Wayne R., Plymouth, MI, United States
 PATENT ASSIGNEE(S): Eagle-Picher Industries, Inc., Cincinnati, OH, United States

States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|----------------------|------|--------------|
| PATENT INFORMATION: | US 4529558 | | 19850716 |
| APPLICATION INFO.: | US 1983-459946 | | 19830121 (6) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Wong, Jr., Harry | | |
| LEGAL REPRESENTATIVE: | Wood, Herron & Evans | | |
| NUMBER OF CLAIMS: | 10 | | |
| EXEMPLARY CLAIM: | 1 | | |
| LINE COUNT: | 408 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A heat curable, solventless liquid prepolymer formed from an N-(R-oxymethyl) acrylamide; a rubber monomer such as isoprene, butadiene or alkyl esters of acrylic acid; and a nitrile monomer such as acrylonitrile or methacrylonitrile. The prepolymer is formed with sufficient chain transfer agent to establish a weight average molecular weight which is less than about 25,000. The prepolymer is heat curable to form a solid polymer with excellent compression set, tensile strength and fuel resistance. The method of formulating these polymers is also disclosed.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 26 OF 32 USPATFULL on STN

ACCESSION NUMBER: 84:39699 USPATFULL
TITLE: Continuous bulk polymerization reactor
INVENTOR(S): Matsubara, Tetsuyuki, Yokohama, Japan
Ito, Norifumi, Yokohama, Japan
Ishida, Yuzuru, Yokohama, Japan
Iwamoto, Mune, Yokohama, Japan
Maeda, Tetsuo, Yachiyo, Japan
PATENT ASSIGNEE(S): Toyo Engineering Corporation, Tokyo, Japan (non-U.S. corporation)
Mitsui Toatsu Chemicals, Incorporated, Tokyo, Japan (non-U.S. corporation)

| | NUMBER | KIND | DATE |
|---------------------|----------------|------|--------------|
| PATENT INFORMATION: | US 4460278 | | 19840717 |
| APPLICATION INFO.: | US 1982-337765 | | 19820107 (6) |

| | NUMBER | DATE |
|-----------------------|--|----------|
| PRIORITY INFORMATION: | JP 1981-10162 | 19810128 |
| DOCUMENT TYPE: | Utility | |
| FILE SEGMENT: | Granted | |
| PRIMARY EXAMINER: | Simone, Timothy F. | |
| LEGAL REPRESENTATIVE: | Fisher, Christen & Sabol | |
| NUMBER OF CLAIMS: | 7 | |
| EXEMPLARY CLAIM: | 1 | |
| NUMBER OF DRAWINGS: | 4 Drawing Figure(s); 2 Drawing Page(s) | |
| LINE COUNT: | 553 | |

AB Disclosed is a continuous bulk polymerization reactor comprising a cylindrical reaction vessel elongated in the direction of the reacting fluid and a shaft installed within the reaction vessel. A plurality of flow of double helical-ribbon agitators are attached to the shaft in such a way that they face in the same direction, and a plurality of baffles having a relative open area of 5 to 40% based on the cross-sectional area of the internal space of the reaction vessel, are disposed between any adjacent ones of the agitators. Thus the formation of stagnant fluid pockets is avoided and excellent piston flow

properties are achieved.

L4 ANSWER 27 OF 32 USPATFULL on STN

ACCESSION NUMBER: 81:33685 USPATFULL
TITLE: Building structure
INVENTOR(S): Carroll, Frank E., Barrington, IL, United States
PATENT ASSIGNEE(S): Carroll Research, Inc., Rolling Meadows, IL, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|--|------|--------------|
| PATENT INFORMATION: | US 4274239 | | 19810623 |
| APPLICATION INFO.: | US 1978-952057 | | 19781017 (5) |
| DISCLAIMER DATE: | 19951017 | | |
| RELATED APPLN. INFO.: | Continuation-in-part of Ser. No. US 1976-720353, filed on 3 Sep 1976, now patented, Pat. No. US 4120131, issued on 17 Oct 1978 | | |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Faw, Jr., Price C. | | |
| ASSISTANT EXAMINER: | Friedman, Carl D. | | |
| LEGAL REPRESENTATIVE: | Speckman, Thomas W. | | |
| NUMBER OF CLAIMS: | 24 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 7 Drawing Figure(s); 2 Drawing Page(s) | | |
| LINE COUNT: | 737 | | |

AB This invention relates to a sheet metal structural shape for use in building construction having a generally box shape with outwardly extending flanges at one end of the substantially parallel sides and inwardly extending flanges at the other end of the parallel sides forming turned inward ends of the inwardly extending flanges and a closure between the ends of the outwardly extending flanges closing the space between the sides at that end. The sheet metal structural shape may be advantageously used as a structural shape in deck structures and in wall structures according to this invention. One deck structure of this invention uses the sheet metal structural shape as a sub-purlin, or purlin on short spans, supporting insulation on the bottom outwardly extending flanges and having roofing material fastened to the inwardly extending flanges at the top end of the structural shape. Thus, a deck is provided with at least a major portion of the insulation beneath the roof decking. The wall structure of this invention provides a wall which may be entirely erected from one side, providing especially suitable shaft and exterior wall construction.

L4 ANSWER 28 OF 32 USPATFULL on STN

ACCESSION NUMBER: 78:57950 USPATFULL
TITLE: Building structure
INVENTOR(S): Carroll, Frank E., Barrington, IL, United States
PATENT ASSIGNEE(S): Carroll Research, Inc., Rolling Meadows, IL, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|---------------------|------|--------------|
| PATENT INFORMATION: | US 4120131 | | 19781017 |
| APPLICATION INFO.: | US 1976-720353 | | 19760903 (5) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Faw, Jr., Price C. | | |
| ASSISTANT EXAMINER: | Friedman, Carl D. | | |
| LEGAL REPRESENTATIVE: | Speckman, Thomas W. | | |
| NUMBER OF CLAIMS: | 19 | | |
| EXEMPLARY CLAIM: | 1 | | |

NUMBER OF DRAWINGS: 9 Drawing Figure(s); 6 Drawing Page(s)

LINE COUNT: 753

AB This invention relates to a sheet metal structural shape for use in building construction having a generally box shape with outwardly extending flanges at one end of the substantially parallel sides and inwardly extending flanges at the other end of the parallel sides forming a slot between the ends of the inwardly extending flanges and a closure between the ends of the outwardly extending flanges closing the space between the sides at that end. The sheet metal structural shape may be advantageously used as a structural shape in deck structures and in wall structures according to this invention. One deck structure of this invention uses the sheet metal structure shape as a sub-purlin, or purlin on short spans, supporting insulation on the bottom outwardly extending flanges and having sheet metal roofing material fastened to the inwardly extending flanges at the top end of the structural shape. Thus, a deck is provided with at least a major portion of the insulation beneath the steel roof decking. Additional insulation may be applied above the steel roof decking and/or poured concrete may be applied above the steel roof decking. The structures of this invention provide lightweight insulated fire resistant structures obtaining hourly fire ratings when preferred materials are used. The wall structure of this invention provides a wall which may be entirely erected from one side, providing especially suitable shaft wall construction.

L4 ANSWER 29 OF 32 USPATFULL on STN

ACCESSION NUMBER: 78:51988 USPATFULL

TITLE: Solar collector

INVENTOR(S): Stephens, James W., 1681 Tilling Way, Stone Mountain, GA, United States 30082

| | NUMBER | KIND | DATE |
|-----------------------|--|------|--------------|
| PATENT INFORMATION: | US 4114599 | | 19780919 |
| APPLICATION INFO.: | US 1977-759019 | | 19770113 (5) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Wayner, William E. | | |
| ASSISTANT EXAMINER: | Tapolcai, Jr., William E. | | |
| LEGAL REPRESENTATIVE: | Laubscher, Lawrence E. | | |
| NUMBER OF CLAIMS: | 6 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 7 Drawing Figure(s); 1 Drawing Page(s) | | |
| LINE COUNT: | 464 | | |

AB A light weight, low cost, non-corroding, high efficiency solar energy collector is comprised of an absorber plate which is adapted to absorb solar energy in the form of heat and to transfer by conductance the heat to a heat exchange medium. The absorber plate has disposed therein a highly heat conductive filler which imparts increased thermal conductivity to the plastic material of the absorber plate, and an energy absorbing pigment; or a sheet of a transparent plastic material is employed which transmits solar energy to a heat exchange medium which has dissolved therein a dye or pigment of a solar energy absorbing color. For a greater thermal conductivity, the sheet of transparent plastic material may have disposed therein a thin sheet of metal which absorbs and conducts heat to a heat exchange medium.

L4 ANSWER 30 OF 32 USPATFULL on STN

ACCESSION NUMBER: 77:16285 USPATFULL

TITLE: Solar heat collector

INVENTOR(S): Liu, Benjamin Y. H., Minneapolis, MN, United States
Jordan, Richard C., St. Paul, MN, United States
Willeke, Klaus, St. Paul, MN, United States

PATENT ASSIGNEE(S): The Regents of the University of Minnesota,
Minneapolis, MN, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|--|------|--------------|
| PATENT INFORMATION: | US 4015582 | | 19770405 |
| APPLICATION INFO.: | US 1974-474941 | | 19740531 (5) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Camby, John J. | | |
| ASSISTANT EXAMINER: | Schwartz, Larry I. | | |
| LEGAL REPRESENTATIVE: | Burd, Braddock & Bartz | | |
| NUMBER OF CLAIMS: | 14 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 8 Drawing Figure(s); 2 Drawing Page(s) | | |
| LINE COUNT: | 416 | | |

AB A highly efficient solar heat collector characterized by a layer of light transmitting insulating (i.e., convection and infra-red radiation suppressing) material disposed between the outer surface of the collector and the heat absorptive layer thereof. Glass fibers are a particularly effective lightweight insulating material which may be used. Through use of flexible polymeric films, lightweight, low-cost solar heat collectors may be fabricated for conversion of existing structures to partial or complete solar heating. Either gaseous or liquid heat transfer fluids may be used. A novel gas-liquid heat exchange system is disclosed.

L4 ANSWER 31 OF 32 USPATFULL on STN

ACCESSION NUMBER: 76:29446 USPATFULL
TITLE: α -Alkoxystyrene resinous adhesives and laminates
INVENTOR(S): Hill, Jr., Harold Wayne, Bartlesville, OK, United States
Moberly, Charles W., Bartlesville, OK, United States
PATENT ASSIGNEE(S): Phillips Petroleum Company, Bartlesville, OK, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|-----------------------|--|------|--------------|
| PATENT INFORMATION: | US 3959568 | | 19760525 |
| APPLICATION INFO.: | US 1974-482879 | | 19740625 (5) |
| RELATED APPLN. INFO.: | Division of Ser. No. US 1972-290313, filed on 19 Sep 1972, now patented, Pat. No. US 3846511 | | |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
| PRIMARY EXAMINER: | Lesmes, George F. | | |
| ASSISTANT EXAMINER: | Roche, R. J. | | |
| NUMBER OF CLAIMS: | 11 | | |
| EXEMPLARY CLAIM: | 1 | | |
| LINE COUNT: | 297 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Resinous graft copolymers useful in adhesive formulations are prepared by polymerization of an alkoxystyrene with an olefinically unsaturated nitrile in a solution or dispersion of a rubber. The polymeric compositions can be applied to surfaces as a hot melt adhesive or solvent cement. Laminates formed with the resinous graft copolymers exhibit substantial lap shear strength.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 32 OF 32 USPATFULL on STN

ACCESSION NUMBER: 74:51423 USPATFULL
TITLE: RESINOUS ADHESIVES AND PRODUCTION THEREOF
INVENTOR(S): Hill, Jr., Harold Wayne, Bartlesville, OK, United States

States
Moberly, Charles W., Bartlesville, OK, United States
PATENT ASSIGNEE(S): Phillips Petroleum Company, Bartlesville, OK, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---------------------|---------------------|------|--------------|
| PATENT INFORMATION: | US 3846511 | | 19741105 |
| APPLICATION INFO.: | US 1972-290313 | | 19720919 (5) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | Granted | | |
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CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Resins useful in adhesive formulations are prepared by polymerization of an alkoxystyrene with an olefinically unsaturated nitrile in a solution or dispersion of a rubber. The polymeric compositions can be applied to surfaces as a hot melt adhesive or solvent cement.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

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L4 ANSWER 31 OF 32 USPATFULL on STN

SUMM Although the resins of this invention are particularly useful as hot melt adhesives or solvent cements, they are also useful as antistatic agents for polyolefin fibers and films and for **polystyrene** plastics. Furthermore, they are of value in forming films and other molded shapes. If desired, additives or other components commonly used in such compositions can be present.

DETD Resins were prepared by copolymerizing alpha-methoxystyrene and acrylonitrile in the presence of a rubbery polymer. Solprene* 1205 rubber, a butadiene/styrene block copolymer with a 75/25, respectively, parts by weight composition and a Mooney viscosity of 47 ML-4 at 212°F (ASTM D 1646-63) as the rubbery component, was dissolved in cyclohexane in the amounts shown in Table I. In Runs 1, 2, and 3, respectively, 1.90, 3.75, and 6.25 grams of Solprene* 1205 rubber were dissolved in 75 milliliters of cyclohexane in 10-ounce bottles. After addition of rubber and solvent the bottles were sealed with extracted rubber gaskets and perforated crown caps. The bottles were alternately evacuated and pressured with nitrogen through a hypodermic needle extending through the gasket to provide a nitrogen atmosphere in the bottles. The bottles were tumbled in a **polymerization** bath containing water as the **heat transfer medium** at 70°C until the rubber was dissolved. The bottles were removed from the bath, uncapped, and 9.0 grams alpha-methoxystyrene, 3.5 grams acrylonitrile, and 0.25 gram azobisisobutyronitrile were added to each bottle. The bottles were flushed as before with nitrogen and replaced in the polymerization bath for 5.5 hours at 70°C. The bottles were removed from the bath, and 0.25 gram azobisisobutyronitrile was added to each opened bottle, which was again purged of air with nitrogen. Polymerization was continued for 18.5 hours for a total of 24 hours by tumbling the bottles at 70°C. As the polymerization proceeded, the reaction medium took on the appearance of a latex, and the final products in the bottles were relatively fluid liquids with the appearance of latex. The contents of each bottle were poured into methanol to precipitate the resin. The resin was filtered out on a fluted paper and chopped in a Waring blender in methanol, filtered to collect the product, and dried in a vacuum oven at about 150°F

(66°C). The products weighed 10.8, 12.7, and 15.5 grams, respectively, which correspond to conversions of the monomers, assuming complete recovery of the rubber charged, of 71, 72, and 74 weight percent. The weight percentage of Solprene* 1205 rubber incorporated in the products were calculated to be 18, 29, and 40.

=> d 14 8 hit

L4 ANSWER 8 OF 32 USPATFULL on STN

SUMM The melt acidolysis polymerization method is useful for the preparation of liquid-crystal polymers (LCPs). These polyester polymers are based on fully aromatic monomers and are prepared by an ester exchange reaction between acetoxyaryl groups and carboxylic acid groups with the elimination of acetic acid at a temperature above the crystalline melting point ($T_{sub.m}$) of the polymer produced. The temperature of the reaction will depend upon the particular monomers employed, but is typically between about 100° C. and about 400° C. The upper limit of the molecular weight of the polymers prepared by melt acidolysis polymerization, therefore, is determined by the ability to extrude the polymer from a melt autoclave. As the crystalline melting point of the polymer exceeds 300° C., this factor becomes more significant. A conventional approach to increasing molecular weight in light of this factor involves the preparation of low-molecular-weight prepolymers by melt acidolysis followed by a subsequent solid-phase polymerization to achieve a polyester of the desired molecular weight. A second conventional approach to increasing molecular weight involves the preparation of high-melting liquid-crystal **polymers** in an inert **heat transfer medium** where the temperature of the stirred polymerization mixture is raised slowly over a matter of hours or days, presumably to ensure that the temperature of the reaction slurry remains below the melting temperature of the polymer as the molecular weight increases.

SUMM More preferably, the surfactant comprises a "CO.sub.2 -phobic" group along with a CO.sub.2 -soluble group, such as a fluoropolymer. The CO.sub.2 -phobic group may be a hydrophobic group, such as a **polystyrene** group, or a hydrophilic group such as carboxylic acid. Such copolymers can take many forms; exemplary forms are graft copolymers, random copolymers, and block copolymers. For example, one suitable copolymer is a copolymer of FOA and acrylic acid.

DETD A 10 ml high pressure reactor with sapphire windows is charged with 1.4 g (7.2 mmoles) of dimethyl terephthalate, 1 ml (1.113 g, 18 mmoles) of ethylene glycol, and 3 drops of concentrated sulfuric acid under flowing argon. After sealing, the reactor is heated to an internal temperature of 100° C. and charged with carbon dioxide at a pressure of 306 bar (4500 psi). The mixture consists of two phases. After 22 hours the pressure has increased to 333 bar (4900 psi). The reactor is vented and cooled to ambient temperature. A waxy material is obtained in quantitative yield, which according to GPC in THF, with **polystyrene** calibration, the solid consists of oligomers up to $M_{sub.n} = 660 \text{ g.mol}^{-1}$.

DETD A 10 ml high pressure reactor with sapphire windows is charged with 2.705 g (13.929 mmoles) of dimethyl terephthalate, 0.863 g (13.913 mmoles) of S ethylene glycol and 3 drops of concentrated sulfuric acid under argon. After sealing, a temperature of 100° C. and a carbon dioxide-pressure of 353 bar (5200 psi) is maintained for 18 hours. After venting and cooling to ambient temperature, a waxy solid is obtained in quantitative yield. According to GPC in THF with **polystyrene** calibration, the solid consists of oligomers up to $M_{sub.n} = 470 \text{ g.mol}^{-1}$.

DETD The procedure according to Example 18 is carried out with a graft- or blockcopolymer as surfactant. The graft- and blockcopolymers are any of

PMMA- or **polystyrene** backbone polymers with poly(dimethylsiloxane) grafts, PMMA- or **polystyrene** backbone polymers with PFOA grafts, PMMA- or **polystyrene** backbone polymers with poly(perfluoroalkylether) grafts, poly(styrene-block-1H,1H-perfluorooctylacrylate), and poly(styrene-block-dimethylsiloxane).

=> d 14 6 hit

L4 ANSWER 6 OF 32 USPATFULL on STN

SUMM **Polystyrene** packaging containers have rapidly gained ground because of their handiness and versatility and found wide use as foamed **polystyrene** trays, containers for drinking water and the like. In recent years, however, there is a demand for as much reduction as possible of residual monomer and solvent in **polystyrene**. In general, volatile matters in styrenic resins manufactured by continuous mass polymerization or solution polymerization are removed by such procedures as flash devolatilization, extrusion devolatilization and membrane devolatilization.

SUMM A polymer solution composition to which the method of this invention is applicable refers to a composition obtained by continuous mass or solution polymerization of an aromatic vinyl monomer alone or a mixture of an aromatic vinyl monomer and monomers copolymerizable with said aromatic vinyl monomer in the presence or absence of rubbery polymers. This polymer solution composition is obtained in the polymerization step in the manufacture of styrenic resins and contains volatile matters such as unreacted monomer and solvent added during the polymerization. Examples are polymer solutions obtained in the manufacture of styrenic resins by mass or solution polymerization, for example, **polystyrene** (GPPS), rubber-modified **polystyrene** (HIPS), styrene-acrylonitrile copolymers (SAN), acrylonitrile-butadiene-styrene copolymers (ABS), styrene-methyl methacrylate copolymers (MS) and methyl methacrylate-butadiene-styrene copolymers (MBS).

DETD The method of this invention can reduce the content of residual volatile matters to a level of 100 ppm or less by multi-stage devolatilization with a specified procedure for the last-stage devolatilization. Hence, aromatic vinyl resins produced by the method of this invention can be used widely as materials for food packaging particularly suitable for foamed **polystyrene** trays and containers of drinking water.

CLM What is claimed is:

1. In a method for removing unreacted monomers and other volatile matters from a polymer solution composition produced by continuous mass polymerization or continuous solution polymerization of an aromatic vinyl monomer alone or a mixture of an aromatic vinyl monomer and other monomers copolymerizable with said aromatic monomer in the presence or absence of rubbery polymers, a method for removing volatile matters from a polymer solution composition which comprises effecting removal of volatile matters in two stages with the use of two flash devolatilizing vessels, adjusting the solid content of the polymer solution composition at the outlet of the devolatilizer before the last-stage devolatilizer to a level in excess of 97%, adding 0.5-4% by weight of a foaming agent to the total polymer solution composition during transfer of said composition from the outlet of the devolatilizer before the last-stage devolatilizer to the inlet of the last-stage devolatilizer, passing said composition from the inlet of the last-stage devolatilizer to a pressure controller while maintaining the pressure of said composition at 10 kg/cm.^{sup.2} or more by means of the pressure controller provided in the last-stage devolatilizer or at the inlet of the last-stage devolatilizer and maintaining the temperature of said composition in the range 190-260° C., thereafter introducing the polymer solution composition to a vapor-liquid separation vessel kept at a vacuum of 20 Torr or less and allowing said composition to foam, wherein the

last-stage devolatilizer is composed of a heating device and a vapor-liquid separation vessel arranged in succession, the heating device is a vertical multitubular heat exchanger consisting of flow tubes for **polymers** and a **heat transfer medium**, heating is effected by the heating device at 210-280° C., and the amount of volatile matters in the polymer solution composition withdrawn from the outlet of the last-stage devolatilizer is made 100 ppm by weight or less.

=> d 14 5 hit

L4 ANSWER 5 OF 32 USPATFULL on STN

TI Highly rigid, high-tenacity impact-resistant **polystyrene**

AB An anionically polymerized impact-modified **polystyrene** has a yield stress of at least 24 MPa, measured at 23° C. to DIN 53455 and a hole impact strength of at least 11 kJ/m.sup.2, measured at 23° C. to DIN 53753, measured in each case on a specimen produced to ISO 3167. A preparation process is described.

SUMM The invention relates to an anionically polymerized, impact-modified **polystyrene** with high stiffness and toughness, and also to a process for its preparation.

SUMM There is a variety of continuous and batch processes in solution or suspension for preparing impact-modified **polystyrene**. As described in Ullmanns Enzyklopadie, Vol A21, VCH Verlauesellschaft Weinheim 1992, pp. 615-625. In these processes a rubber, usually polybutadiene, is dissolved in monomeric styrene and the styrene is free-radical polymerized via thermal or peroxidic initiation. Besides homopolymerization of styrene, graft polymerization of styrene onto polybutadiene also takes place. Consumption of the monomeric styrene with the formation of **polystyrene** gives rise to a "phase inversion". The properties of the impact-modified **polystyrene** are determined by the morphology, the particle size and the particle size distribution of the disperse rubber particles. These are dependent on a variety of process parameters, such as the viscosity of the rubber solution and sheer forces during stirring.

SUMM Since the reaction mechanisms for free-radical and anionic polymerization of styrene differ, the process parameters known for free-radical preparation of impact-modified **polystyrene** are not directly transferable to the anionic polymerization of styrene in the presence of rubbers. For example, exclusive use of homopolybutadiene is not possible since no graft reactions occur in the anionic polymerization of styrene.

SUMM It is an object of the present invention to provide an anionically polymerized, impact-modified **polystyrene** with high stiffness and toughness. The impact-modified **polystyrene** should be low in residual monomers and residual oligomers and have a low ethyl benzene content. A further object was to find an anionically polymerized impact-modified **polystyrene** with cell-particle morphology, and also a process for its preparation.

SUMM We have found that this object is achieved by obtaining a novel impact-modified **polystyrene** via anionic polymerization of styrene in the presence of a rubber, the rubber used being a styrene-butadiene-styrene three-block copolymer with a styrene content of from 5 to 75% by weight, preferably from 25 to 50% by weight.

SUMM The disperse soft phase of the novel impact-modified **polystyrene** preferably comprises a styrene-butadiene block copolymer and has cell-particle morphology.

- SUMM The novel impact-modified **polystyrene** may be obtained by anionic polymerization of styrene in the presence of a rubber. The rubber used here comprises a styrene-butadiene-styrene three-block copolymer with a styrene content of from 5 to 75% by weight, preferably from 25 to 50% by weight or a styrene-butadiene two-block copolymer or a mixture of a styrene-butadiene two-block copolymer with a homopolybutadiene, where the styrene-butadiene two-block copolymer or, respectively, the mixture has a styrene content of from 25 to 75% by weight, preferably from 30 to 50% by weight.
- SUMM The rubber content, based on the impact-modified **polystyrene**, is usefully from 5 to 25% by weight.
- SUMM A magnesium content of from 0.1 to 100 mmol/kg and/or an aluminum content of from 0.01 to 50 mmol/kg, based in each case on the impact-modified **polystyrene**, does not generally significantly impair mechanical properties.
- SUMM To increase elongation at break, from 0.1 to 10% by weight, preferably from 0.5 to 5% by weight, of mineral oil, based on the impact-modified **polystyrene**, may be added in the novel process.
- SUMM The content of styrene monomers in the impact-modified **polystyrene** is generally not more than 50 ppm, preferably not more than 10 ppm, and the content of styrene dimers and of styrene trimers is not more than 500 ppm, preferably not more than 200 ppm, particularly preferably less than 100 ppm. The ethylbenzene content is preferably below 5 ppm.
- SUMM The novel impact-modified **polystyrene** is suitable for producing fibers, films or moldings.
- DETD The molecular weights and molecular weight distributions were determined by gel permeation chromatography (GPC) in tetrahydrofuran and evaluating the resultant chromatograms using calibration by **polystyrene** or by polybutadiene.
- DETD For the mechanical and physical tests on the impact-modified **polystyrenes**, compression-molded (DIN 16770--Part 1) and, respectively, injection-molded (ISO 3167) specimens were produced. Yield stress and elongation at break were determined at 23° C. to DIN 53455. hole notched impact strength was determined to DIN 53753 at 23° C. on compression-molded test specimens of dimensions 50+6+4 mm (hole diameter: 3 mm) or on injection-molded test specimens of dimensions 80+10+4 mm. Unless stated otherwise, the tests were carried out on compression-molded test specimens.
- DETD The resultant butadiene-styrene block copolymer had an average molecular weight of $M_w=308,000$ g/mol and a polydispersity M_w/M_n of 1.09 (determined by gel permeation chromatography, GPC, **polystyrene** calibration). The residual butadiene content was less than 10 ppm. The styrene content was 37%; 9% of the butadiene fraction of the rubber was of the 1,2-vinyl type (determined by ¹H nuclear resonance spectroscopy). The solution viscosity of a 5.43% strength solution of the rubber in toluene was 42 mPas.
- DETD After a few hours a stable equilibrium condition became established in all parts of the system. The pressure drop across the entire system was 2.9 bar. The solids content was 26% by weight at the exit from the stirred-tank reactor, 58% by weight at the exit from the first tower reactor, and 73% by weight at the exit from the second tower reactor, corresponding to 100% monomer conversion. The **polystyrene** matrix had a molecular weight M_w of 164,500 g/mol and a polydispersity M_w/M_n of 2.95. The distribution was monomodal. Determinations on the impact-modified **polystyrene** gave a content of less than 5 ppm of styrene, less than 5 ppm of ethylbenzene and 83 ppm of toluene. The

impact-modified **polystyrene** had a yield stress of 27 N/mm.², elongation at break of 25% and hole notched impact strength of 12 kJ/m.².

DETD After a short time a stable equilibrium condition became established in all parts of the system. The pressure drop across the entire system was 2.2 bar. The solids content was 41% by weight at the exit from the stirred-tank reactor and 79% by weight at the exit from the tubular reactor, corresponding to 100% monomer conversion. The **polystyrene** matrix had a molecular weight Mw of 169,000 g/mol and a polydispersity Mw/Mn of 2.62. Determination gave a content of less than 5 ppm of styrene, less than 5 ppm of ethylbenzene and 102 ppm of toluene. The impact-modified **polystyrene** had a yield stress of 29 N/mm.², elongation at break of 20% and hole notched impact strength of 11 kJ/m.².

DETD The reactor used was a double-walled tubular reactor with an internal diameter of 29.7 mm and a length of 4200 mm. The tubular reactor was designed for a pressure of up to 100 bar and for a temperature of up to 350° C. The tubular reactor was divided into two zones of equal length, each temperature-controlled via a cocurrently conducted heat-transfer medium. The temperatures of, respectively, the **polymerization** mixture and the **heat-transfer medium** were determined via three temperature sensors uniformly distributed over the reaction path.

DETD After a short time stable conditions became established in all parts of the system. The pressure drop across the entire system was 2.1 bar. The solids content was 31% by weight at the end of the first section of the tubular reactor and 80% by weight at the exit from the tubular reactor. The **polystyrene** matrix had a molecular weight Mw of 185,000 g/mol and a polydispersity Mw/Mn of 2.12. Determination gave a content of 12 ppm of styrene, less than 5 ppm of ethylbenzene and 87 ppm of toluene. The impact-modified **polystyrene** had a yield stress of 26 N/mm.², elongation at break of 23% and hole notched impact strength of 11 kJ/m.².

DETD After a few hours constant operating conditions became established. The solids content was 29% by weight at the exit from the first reactor and 56% by weight after the first tower. Quantitative conversion was found at the exit from the continuous system. The pressure drop across the entire system was 2.3 bar. The **polystyrene** matrix had a molecular weight Mw of 162,400 g/mol and polydispersity Mw/Mn of 2.68. The distribution was monomodal. Determination gave a content of less than 5 ppm of styrene, less than 5 ppm of ethylbenzene and 112 ppm of toluene. The impact-modified **polystyrene** had a yield stress of 17 N/mm.², elongation at break of 35% and hole notched impact strength of 14 kJ/m.².

DETD After a short time constant operating conditions became established. The solids content was 36% by weight at the exit from the first reactor. Quantitative conversion was found at the exit from the continuous system. The **polystyrene** matrix had a molecular weight Mw of 171,000 g/mol and polydispersity Mw/Mn of 2.83. The distribution was monomodal. Determination gave a content of less than 5 ppm of styrene, less than 5 ppm of ethylbenzene and 96 ppm of toluene. The impact-modified **polystyrene** had a yield stress of 20 N/mm.², elongation at break of 36% and hole notched impact strength of 15 kJ/m.².

DETD After a short time constant operating conditions became established. The solids content at the exit from the first reactor was 35% by weight. Quantitative conversion was found at the exit from the continuous system. The **polystyrene** matrix had a molar mass Mw of 171,000 g/mol and a polydispersity Mw/Mn of 3.34. The distribution was monomodal.

DETD After a short time constant operating conditions became established. The solids content at the exit from the first reactor was 35% by weight. Quantitative conversion was found at the exit from the continuous system. The **polystyrene** matrix had a molar mass Mw of 166,000

g/mol and a polydispersity M_w/M_n of 3.30. The distribution was monomodal.

DETD After a few hours a stable equilibrium condition became established in all parts of the system. The pressure drop across the entire system was 2.8 bar. The solids content was 37% by weight at the exit from the stirred-tank reactor, and 58% by weight at the exit from the first tower reactor. Quantitative conversion was found at the exit from the second tower reactor. The **polystyrene** matrix had a molar mass $M_{sub.w}$ of 152,000 g/mol and polydispersity $M_{sub.w}/M_{sub.n}$ of 2.62. The distribution was monomodal. Determinations gave a content of less than 5 ppm of styrene, less than 5 ppm of ethylbenzene and 52 ppm of toluene. The material had a yield stress of 28 N/mm², hole notched impact strength of 13 kJ/m², heat distortion temperature (Vicat B/50) of 94° C. and melt volume rate MVR at 200/5 (ISO 1133) of 3.9 cm³/10 min. An electron micrograph showed cellular particle morphology. The average particle diameter was 3.2 μ m.

DETD After a short time constant operating conditions became established. The solids content at the exit from the first reactor was 35% by weight. Quantitative conversion was found at the exit from the continuous system. The **polystyrene** matrix had a molar mass M_w of 187,000 g/mol and a polydispersity M_w/M_n of 2.83. The distribution was monomodal.

DETD After a short time constant operating conditions became established. The solids content at the exit from the first reactor was 35% by weight. Quantitative conversion was found at the exit from the continuous system. The **polystyrene** matrix had a molar mass M_w of 173 000 g/mol and a polydispersity M_w/M_n of 3.14. The distribution was monomodal.

DETD After a short time constant operating conditions became established. The solids content at the exit from the first reactor was 34.9% by weight. Quantitative conversion was found at the exit from the continuous system. The **polystyrene** matrix had a molar mass M_w of 173,000 g/mol and a polydispersity M_w/M_n of 3.06. The distribution was monomodal.

DETD After a short time constant operating conditions became established. The solids content at the exit from the first reactor was 35% by weight. Quantitative conversion was found at the exit from the continuous system. The **polystyrene** matrix had a molar mass M_w of 158,000 g/mol and a polydispersity M_w/M_n of 3.40. The distribution was monomodal.

DETD After a short time constant operating conditions became established. The solids content at the exit from the first reactor was 35.9% by weight. Quantitative conversion was found at the exit from the continuous system. The **polystyrene** matrix had a molar mass M_w of 188,000 g/mol and a polydispersity M_w/M_n of 2.98. The distribution was monomodal.

CLM What is claimed is:

1. An impact-modified **polystyrene** which has been obtained by polymerization of styrene in the presence of an asymmetric anionically polymerized styrene-butadiene-styrene three-block copolymer with a styrene content of from 5 to 75% by weight, wherein a polymerization of said three-block copolymer is carried out in the presence of an organic alkali metal compound, and wherein a polymerization of styrene is carried out in the presence of a trialkylaluminum compound and/or dialkylmagnesium compound.

2. An impact-modified **polystyrene** as claimed in claim 1, which has a disperse soft phase with cell-particle morphology and comprising a styrene-butadiene-styrene three-block copolymer.

3. An impact-modified **polystyrene** as claimed in claim 1, which has been obtained by anionic polymerization of styrene in the presence of a styrene-butadiene styrene three-block copolymer with a styrene content of from 25 to 50% by weight.

4. An impact-modified **polystyrene** as claimed in claim 1, wherein a specimen produced to ISO 3167 has a yield stress of at least 24 Mpa, measures at 23° C. to DIN 53455, and a hole notched impact strength of at least 11 kJ/m.sup.2, measured at 23° C. to DIN 53753.
5. An impact-modified **polystyrene** as claimed in claim 1, which has been obtained by anionic polymerization of styrene in the presence of an asymmetric styrene-butadiene-styrene three-block copolymer S.sub.1-B-S.sub.2, where S.sub.1 is a styrene block with a weight-average molar mass M.sub.w of from 5000 to 100000 g/mol, B is a butadiene block with a weight-average molar mass M.sub.w of from 12000 to 500000 g/mol and S.sub.2 is a styrene block with a weight-average molar mass M.sub.w of from 30000 to 300000 g/mol.
6. An impact-modified **polystyrene** as claimed in claim 1, wherein the content of styrene monomers is not more than 50 ppm and the content of styrene dimers and styrene trimers is not more than 500 ppm.
7. An impact-modified **polystyrene** as claimed in claim 1, wherein the content of ethyl benzene is below 5 ppm.
8. An impact-modified **polystyrene** as claimed in claim 1, which has a magnesium content of from 0.1 to 100 mmol/kg and/or an aluminum content of from 0.01 to 50 mmol/kg, in each case based on the impact-modified **polystyrene**.
10. A process for preparing impact-modified **polystyrene** by polymerization of styrene in the presence of a rubber, which comprises using, as rubber, an asymmetric anionically polymerized styrene-butadiene-styrene three-block copolymer with a styrene content of from 5 to 75% by weight, wherein a polymerization of said three-block copolymer is carried out in the presence of an organic alkali metal compound, and wherein a polymerization of styrene is carried out in the presence of a trialkylaluminum compound and/or dialkylmagnesium compound.
11. A process for preparing impact-modified **polystyrene** as claimed in claim 10, wherein the polymerization of styrene is carried out in the presence of a trialkylaluminum compound and/or dialkylmagnesium compound.
12. A process for preparing impact-modified **polystyrene** as claimed in claim 10, where the polymerization is carried out in toluene as solvent.
13. A fiber, a film or a molding produced from impact-modified **polystyrene** as claimed in claim 1.

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COST IN U.S. DOLLARS

SINCE FILE

TOTAL

ENTRY

SESSION

FULL ESTIMATED COST

89.13

89.34

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